

An inhaler .....	23
Paper bag or cloth cone .....	3
Skinner's mask .....	2
A mask .....	1
Fesmarch's mask .....	5
Metal inhaler with plenty of air .....	5
Clover's apparatus .....	59
Not stated .....	59

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**After-Effects.**—The following is a brief account of some of the chief conditions which have been called the after-effects of anesthetics.

**Nausea and vomiting** constitute the most conspicuous and distressing, though not the most dangerous of the consequences of anesthesia. Nitrous oxide causes the least after-disturbance of this kind; and while ether causes nausea and vomiting more frequently than chloroform, more cases of protracted and dangerous vomiting are met after chloroform than after ether.

Patients differ greatly in respect to this effect, and a patient may vomit excessively on one occasion and little or none on another under apparently like conditions.

Patients properly prepared for the administration have less sickness, as a rule, than those not so prepared, although in many instances a case presenting a full stomach and no preparation will not be nauseated after anesthesia.

Washing out the stomach at the close of the administration will lessen or prevent nausea and vomiting in a large percentage of cases, and is an excellent routine practice if carefully done.

At later periods this is also one of the best means of treatment, and after consciousness has been restored it may be carried out at proper intervals by allowing the patient to drink a glass of warm water and expel it by vomiting. A large dose of the bromide of sodium or potassium by way of the rectum will often act beneficially in this condition, and the administration of opium is occasionally the only means that will control it.

**Headache** following anesthetics, commonly seen after prolonged administration of nitrous oxide, may be best relieved by cold applications to the head, bromides, or opiates.

**Bronchitis, broncho-pneumonia, and typical lobar pneumonia** have occurred with noticeable frequency after anesthetics. These conditions are observed after all anesthetics, but more commonly after ether than after chloroform. They are probably not due to the direct effect of the anesthetics upon the pulmonary tissues, but are caused, for the most part, by infections of the lungs through material aspirated into them from the throat during the narcosis, such material often carrying pneumococci and other bacteria derived from the throat and nose. Add to this the chilling influences attending the anesthesia and the operation, the repression of coughing after certain operations, and the exposure incident to change from the operating room, change of clothing, etc., and it is not surprising that these pulmonary after-effects occasionally develop.

The treatment of these conditions is the same as though they occurred under other circumstances. Prophylaxis consists chiefly in the use of clean inhalers, cleansing the mouth, nose, and throat before the administration, avoiding the aspiration of foreign material into the air passages, keeping the patient from exposure and depression.

**Renal congestion, nephritis, and urinary suppression** are not infrequently observed after the administration of anesthetics, as referred to under "Physiological Action." The effects of the deprivation of fluids before and after operation, exposure, and sepsis must not be overlooked in this connection. Treatment should be carried out on usual lines. Saline infusion by way of the rectum, cellular tissue, or veins has proved of great benefit in promoting kidney action under these conditions.

Jaundice, glycosuria, insanity, and other abnormal states have been noted after anesthetics have been administered. Their exact relations to the narcosis are not fully understood.

**After-Care.**—During the recovery of patients from the effects of anesthetics they should have certain special

care made necessary by their condition. They should receive assistance during the vomiting which may follow, and, owing to the suddenness with which this may occur, the patient should never be left alone till he is quite capable of taking conscious care of himself. Vomiting is most easily and safely accomplished if the patient is on the side, and this position should be assumed if possible. If the dorsal position is necessary, the head should be turned well to the side during vomiting and elevation of one shoulder will help the position. Large particles of vomited matter should be removed from the mouth as quickly as possible. The common custom of pushing the jaw forward during vomiting is unnecessary and dangerous. It defeats the effort of the patient to protect his air passages.

The patient must be guarded from exposure during recovery. The chilling influences of the anesthetic and the operation render the patient unusually sensitive, and more than usual covering should be provided. Artificial heat should be used if necessary, but in its application it should be remembered that the patient is more or less anesthetic and may not notice the presence of a hot-water bag or bottle that is burning him. This is a frequent and disastrous accident. The patient should not be exposed to draughts. Undue sweating should be avoided.

The question of food and drink is important. The custom of withholding everything for many hours is unnecessary. The patient's desire for food or drink is often a reliable guide for the beginning of the same. Weak patients should not be kept as long as others without nourishment. As a rule, it seems best to begin with rather small quantities of warm fluids, proceeding according to the particular conditions present. Thirst may often be relieved by the combination of large amounts of fluid by the rectum and small amounts by the mouth.

Thomas L. Bennett.

[As this article is going to press the "report of the Anesthetics Committee of the British Medical Association" is announced. It comprises a careful and minute study in great detail of 25,920 cases from reliable sources. The following conclusions, taken from the *Lancet*, London, are thought to be justified:

**CONCLUSIONS.**

**Relative Safety of the Various Anesthetics.**—1. The relative safety of the various anesthetics may be gathered from the statistical tables in the report. When only those cases of danger which were held to be due entirely to the anesthetic are considered the following instructive figures are obtained, further emphasizing the danger of chloroform as contrasted with ether. Cases of danger (including deaths) considered to be due entirely to the anesthetic: under chloroform, 78, giving a danger rate of .582 per cent.; under the A. C. E. mixture, 1, giving a danger rate of .147 per cent.; under mixtures of chloroform and ether, 2, giving a danger rate of .478 per cent.; under the A. C. E. mixture followed by chloroform, 1, giving a danger rate of 1.694 per cent.; under chloroform preceded by ether, 5, giving a danger rate of 2.2 per cent.; under chloroform followed by mixtures of alcohol, chloroform, and ether, 1, giving a danger rate of .36 per cent.; under ether, 2, giving a danger rate of .065 per cent.; under "gas and ether," 3, giving a danger rate of .096 per cent.; under ether preceded by chloroform, 1, giving a danger rate of .480 per cent.; under ether preceded by the A. C. E. mixture, 0; under the chloroform group of anesthetics (addition of the first six headings above), 88, giving a danger rate of .584 per cent.; and under the ether group of anesthetics (addition of the last four headings above), 6, giving a danger rate of .085 per cent. 2. Although (excluding nitrous oxide) ether may be accepted as the safest routine agent, certain circumstances determined by the state of the patient, the nature of the operation, etc., may render the use of some other anesthetic or combination of anesthetics both safer and easier.

**The Best Methods of Administration.**—3. No method of

administration of chloroform is free from danger, but an examination of the complicated cases appears to show that the occurrence of danger depends largely upon the administrator who employs any particular method. 4. No conclusion from the evidence before the committee as to the best method of administration of ether and "gas and ether" is possible. 5. The data warrant the conclusion that the A. C. E. mixture should not be given from a closed inhaler—e.g., Clover's. This conclusion applies to all mixtures containing chloroform.

**Best Methods of Restoration.**—7. The sub-committee are unable from the material at their disposal to draw any conclusion upon this point.

**Clinical Evidence Regarding Anesthetics Generally.**—8. Anesthetics are more commonly associated with complications and dangers in males than in females. 9. Excluding infancy, and taking anesthetics collectively, the complications and dangers of anesthesia increase *pari passu* with advancing age. 10. Anesthetics are notably more dangerous in proportion as the gravity of the patient's state increases. 11. Danger to life is especially likely to be incurred at early periods of the administration of anesthetics, while the tendency to less grave complications increases directly with the duration of anesthesia. 12. The tendency for complications, dangerous and otherwise, to occur increases *pari passu* with the gravity of the operation.

**Clinical Evidence Regarding Chloroform.**—13. Chloroform is about twice as dangerous in males as in females. 14. Chloroform is most dangerous during early infancy and after thirty years of age; least so from ten to thirty years of age. 15. In conditions of good health chloroform is very much more dangerous than other anesthetics. In grave conditions chloroform still remains the least safe anesthetic, but the disparity between it and other anesthetics is far less marked than in health. 16. When danger occurs under chloroform, whatever its exact nature may be, there is abundant evidence that in a large proportion of cases the symptoms that are observed are those of primary circulatory failure. 17. Imperfect anesthesia is the cause of a large number of cases of danger under chloroform. 18. Vomiting during anesthesia, which may lead to danger, seems to be more frequent under chloroform than under other anesthetics. 19. Struggling is very much more frequent in the complicated cases under chloroform than in the uncomplicated, and this phenomenon must therefore be regarded as a source of grave danger under chloroform. 20. The tendency for circulatory complications to appear increases directly with the relative amount of chloroform in the anesthetic employed. 21. While vomiting is more common after administrations of ether, severe and prolonged vomiting is more common when chloroform has been used. 22. Circulatory depression following anesthetics is more common after chloroform than after ether. 23. While the respiratory complications of anesthesia as a whole are of equal frequency under the ether and chloroform groups respectively, yet those that occur under ether are mostly of a trifling and transitory nature while those that occur under chloroform are more grave and persistent.

**Clinical Evidence Regarding Ether.**—24. Under ether the complications of anesthesia are more frequent with males than with females, but with the former they are generally slight, ether being rather more dangerous with females than with males. 25. Ether, where employed throughout or preceded by nitrous oxide gas or by the A. C. E. mixture, is singularly free from danger in healthy patients. 26. Minor troubles in administration due to laryngeal irritation and increased secretion are more common under ether and "gas and ether" than under chloroform and its mixtures. 27. Struggling occurs more frequently with ether when given alone than with other anesthetics, but it rarely leads to danger. 28. After-vomiting is more common with ether than with other anesthetics, but it is usually transient. 29. Bronchitis is much more common as an after-effect of ether than of chloroform. 30. With "gas and ether," as with

ether, dangers are more common in females, although complications are more frequent in males.

**Clinical Evidence Regarding Mixtures and Successions of Anesthetics.**—31. The A. C. E. mixture in most of the statistical tables holds an intermediate position between chloroform and ether. 32. The A. C. E. mixture is more dangerous in males than in females, but not to such a marked degree as is chloroform. 33. The administration of ether antecedent to chloroform does not abolish the possibility of chloroform dangers. 34. The various mixtures and successions of anesthetics were recorded too infrequently to justify definite conclusions.

**General Conclusion.**—35. From the evidence before the sub-committee they are convinced that by far the most important factor in the safe administration of anesthetics is the experience which has been acquired by the administrator. In many cases the anesthetization completely transcends the operation in gravity and importance, and to insure success, particularly in these cases, it is absolutely essential that an anesthetist of large experience should conduct the administration.]

**CHLOROL** is a disinfectant and deodorizer consisting of an aqueous solution of one per cent. each of bichloride of mercury, sodium chloride, and hydrochloric acid, and three per cent. of copper sulphate. W. A. Bastedo.

**CHLOROMA.**—*Cancer vert.* A tumor belonging to the general class of sarcoma, more precisely to the group of lymphoma, lymphosarcoma, so-called leukemic and pseudo-leukemic tumors, etc. The name was given by King, of Glasgow, in 1853, and indicates the remarkable color of the new growth, which is usually a bright green. Chloroma is remarkable for the frequency with which it affects the periosteum of the cranium, especially in the orbital and temporal regions and in the dura. Various other parts of the periosteum are also frequently affected, besides the lymph glands, bone marrow, liver, kidneys, spleen, lungs, pleura, and other organs. In some cases the tumors have first been discovered in peripheral organs such as the mammary gland or the axillary lymphatic glands, but even in such cases it is probable that the primary growth is in the periosteum of the cranium. The new growth has a tendency to invade the connective tissue, involving fasciæ, tendons, etc., and sometimes forms very extensive infiltrations. In structure the tumor consists of a fine reticulum in which cells of the size and character of lymphocytes lie, traversed by bands of connective tissue continuous with that of the seat. The consistence varies from very soft to very hard, depending chiefly on the connective tissue. The cause of the green color is not known. According to some it is a fat pigment; others compare it to the pigment of green pus. Chloroma occurs especially in early life, although a number of cases have been observed in middle life. More cases have been observed in males than in females. Clinically, chloroma is characterized by rapidly increasing anemia with petechiæ, nose-bleed, and sometimes scorbutic symptoms; by loss of weight, fever, headache, deafness, tinnitus aurium, blindness and double vision, and by facial paralysis and exophthalmus. Many cases have been first seen in eye or ear clinics, on account of the special symptoms mentioned, and it is possible that in some cases not examined anatomically the disease has been mistaken for an ordinary orbital sarcoma. In a number of cases increase of leucocytes has been observed, the increase affecting especially mononuclear cells having the general character of lymphocytes, the appearance of the blood in other respect closely resembling that in cases of so-called acute leukæmia. The course of the disease is rapid and progressive. The changes in the blood and the structure of the tumors have led a number of observers to assign chloroma to the group of diseases including leukæmia, pseudoleukæmia, certain cases of lymphosarcoma, and some of the tumors described as myeloma. Ignorance of the etiology of all of these processes makes a definite opinion impossible at this time. The idea of bacterial infection is very strong, but posi-

tive proof is as yet absent. Chloroma should be recognized in most cases comparatively early on account of the striking combination of symptoms, especially from the coexistence of anæmia with or without increase of lymphocytes, the characteristic new growths in the orbital and temporal region, the ear symptoms and others mentioned above.

Most of the observations on chloroma are referred to in articles of Dock, *American Journal of the Medical Sciences*, August, 1893, and Lang, G., *Archives générales de Médecine*, November et seq., 1893, and July-September, 1898. *George Dock.*

**CHLOROSIS.**—Chlorosis is a term applied to a specific form of anæmia which occurs in young women about puberty and which is often characterized by a greenish-yellow tint of the skin, whence the derivation of the name *χλωρος*, yellowish green.

Notwithstanding the great progress, in recent years, in our knowledge of disorders of the blood and of the changes, particularly in its corpuscular elements, characteristic of different diseases, the position of chlorosis as an independent malady has been in no way affected, and it still remains quite distinct from all other anæmias. Thus every other form of anæmia is found in both sexes, but the occurrence of true chlorosis in males is now generally denied. Chlorosis, therefore, occurring only in women, and limited in them to the time of life connected with the development of their sexual function, shows that this disease is somehow conditioned by that function. This primary fact should dispose of several hypotheses which have been advanced both as to its etiology and its pathology. Thus Sir Andrew Clark's theory that it is caused by auto-intoxication from retained fecal accumulation leaves unexplained why it never happens to constipated men, and Virchow's theory that it is due to congenital hypoplasia of the arterial system is negated by the occurrence of too small arteries, including the aorta, in both sexes. The inference, therefore, seems clear that chlorosis is in some way related to the function of ovulation, and the problem is to find what that relation is.

At present the examination of the blood itself is the first requisite in determining the nature of any form of anæmia, and it is because the changes in chlorosis are so constant in their contrast with other cases of blood impoverishment that its specific nature is so plainly demonstrated. Thus in all febrile anæmias, as in tuberculosis, rheumatism, etc., the whole blood becomes impoverished, both the corpuscles and the blood plasma being diminished. In chlorosis, while the corpuscles may be diminished in number (though very commonly this is much less than the paleness of the patient would suggest), yet the proteids of the plasma, as a rule, are increased, a feature peculiar to chlorosis. This fact also serves to distinguish chlorosis from the anæmia caused by loss of blood, for in the latter the serum is more watery and the specific gravity of the plasma is low, while in chlorosis, different from all other anæmias, the specific gravity of the plasma is high and often higher than normal. In the secondary anæmia of parenchymatous nephritis, the presence of anasarca and of albuminuria suffices to clear the diagnosis. More uncertainty might arise in some cases of inanition in young women suffering from gastric ulcer, especially as dyspepsia and gastric pains are common among chlorotics; but the palpable signs of gastritis with pain after eating and the occurrence of hæmatemesis are distinctive in these cases, while the examination of the blood does not show the specific deficiency of hæmoglobin in the red corpuscles characteristic of chlorosis, nor is the chlorotic hue present in the complexion. Some leucocytosis is also commonly present, while in chlorosis it is absent.

From the sallow anæmia of some forms of chronic hepatic disease, as a sequel to chronic malaria, chlorosis may be distinguished by the conjunctiva being quite clear instead of yellowish; there is no enlargement of the liver, nor do we find the rough, parchment-like con-

dition of the skin, with movable folds, which distinguishes hepatic marasmus, as the skin in chlorotics is of silky smoothness and well rounded or plump. In active malaria the presence of the plasmodium malariae decides the diagnosis. From leukemia, which in the absence of emaciation often resembles chlorosis, the great excess of white corpuscles at once reveals the difference, as leucocytosis does not occur in chlorosis, nor does enlargement of the lymphatic glands. From that comparatively rare and fatal disease, true splenic anæmia, which occurs without either involvement of the lymphatic glands or leucocytosis, the diagnosis is easy by reason of the great enlargement of the spleen in that disease, while it is wholly absent in chlorosis. From pernicious anæmia, in which disease the common occurrence of a lemon-yellow hue of the skin might be mistaken for the tint of chlorosis, the examination of the blood shows the greatest contrasts. Not only is the diminution of the red corpuscles far greater than in chlorosis, but poikilocytosis or irregularity in the shape and size of the corpuscles is characteristic; megaloblasts and microblasts and nucleated red corpuscles along with the myelocytes are found, all of which are absent or extremely rare in chlorosis. The most distinctive difference, however, is that which exists between chlorosis and pernicious anæmia. In the latter disease the percentage of hæmoglobin in the individual corpuscles, especially the smaller forms, is very high, some of them having a brilliant red color, while deficiency of hæmoglobin in the red cells is the distinctive feature of chlorosis. In the anæmia of malignant disease the blood also shows poikilocytosis, but otherwise the cancerous cachexia with its sallow, muddy skin and general emaciation would suffice to distinguish it from chlorosis, apart from the fact that the latter is a disease of youth, at which period of life cancer is rare.

In other words, the blood of chlorotics is deficient in its oxygen-carrier, hæmoglobin, and scarcely deficient in anything else. The red cells may equal in number those found in women in fair health, but they are pale and the percentage of hæmoglobin may fall from one hundred to sixty-five, or forty per cent., or even lower. A loss of breathing power necessarily follows, with results, as regards the muscular function, which adequately explain the chief clinical symptoms of the disease.

Chlorosis is markedly hereditary, mothers of young women with it often stating that they were similarly affected when at their daughters' age. Different from many secondary anæmias, it is as often found among the well-to-do classes as among the poor or poorly fed. Among European races, at least, it is pretty equally distributed, being as common in Italy as in England or in America. The element of age, however, is significant. A first attack after twenty-five is almost unknown, and if it does occur then or later it is a relapse from a former attack. Chlorosis may occur before menstruation, but the commonest period is in the quinquennial between fifteen and twenty.

**SYMPTOMS.**—Muscular power in all animals is directly proportioned to the activity of respiration, that is, to the intake of oxygen. As it is the hæmoglobin in our blood which enables us to breathe, a deficiency of that element will have for its first sign breathlessness. This symptom, therefore, is one of the earliest and most constant in chlorosis. Mural weakness of the heart, at first dynamical and later intrinsic from fatty degeneration, is a natural consequence of deficiency of oxygen, and hence these patients are prone to palpitation on exertion and to attacks of syncope. The muscular apparatus of the alimentary canal also suffers, and atony with passive dilatation of the stomach, and the same condition in the intestinal canal, give rise to the dyspepsia and constipation with borborygmi which characterize a majority of these patients. Easy exhaustion and fatigue of the skeletal muscles is evidenced by the general sense of languor and lassitude on the one hand, and by a great variety of spinal aches on the other, the commonest localities being, as we might expect, at the nape of the neck, where the weight of the head is felt, and in the

lumbar region, where the whole weight most tells on the spinal column in standing or walking. As in all cases in which deficient muscular power fails to keep the vertebrae in their normal position, reflected neuralgias from pressure on the spinal roots are very common. They appear in the form of headaches, pains in the eyes, intercostal pains, and others referred to various points in the abdominal walls.

The chlorotic hue is absent in about forty per cent. of all cases, whether blondes or brunettes. The examination of the blood shows what a mistake it is to suppose that the disease necessarily shows itself in the tint of the skin. Some clear-complexioned blondes and likewise brunettes show nothing but simple paleness as an habitual state, with faces also that readily heighten in color on excitement. Nowhere, however, is the evidence of anæmia so sure as on the backs of the hands, and next to that on the ears. The chlorotic hue, however, may not be specially noticeable about the face, and yet be readily noted on baring the chest. In typical cases the discoloration is very characteristic, especially about the lower folds of the skin of the face, but that it is in no sense jaundice is revealed by the pale caruncle of the eye, the transparent conjunctiva, the blue sclerotic, and the anæmic mucous membranes of the mouth. No theory as to the cause of the chlorotic discoloration has yet seemed to me satisfactory.

As to special symptoms, the pupils are often dilated and so sluggish as occasionally to impart the same staring expression which is of such unfavorable import in renal disease. An annoying dry cough is sometimes quite persistent, especially at night, or coming on in excited conversation. It is probably connected with the functional dyspnoea of the disease and is best relieved by improving the blood and not by cough medicines, though it is often temporarily allayed by ten or fifteen grains of ammonium bromide with a teaspoonful of aromatic spirits of ammonia. The pulse presents some peculiarities. Different from other anæmias (except that due to kidney disease), the pulse of chlorotics often shows considerable tension. The difference in this respect from all febrile anæmias, or from that following loss of blood, or in pernicious anæmia, is quite pronounced. This tension may be due to the full volume of the circulating fluid along with capillary retardation from lessened activity of oxygenation in the tissues. An indication that capillary interchange is slow in chlorosis is found in the general puffiness of the face and extremities with a tendency to œdema of the ankles.

In no other anæmia is the venous hum so loud in the jugulars, particularly the right, as in chlorosis, its loudness being increased on standing and by light pressure upon the vein with the stethoscope. It is a markedly vibratory sound, and the vibration of the vein can often be felt by the finger laid upon it. It varies capriciously from time to time, and as it has little diagnostic or prognostic value, we will not enter upon the difficult question of the mechanism of its production.

Vibration of the arteries so that they are seen to throb also happens occasionally in chlorosis, with now and then a systolic murmur in them, especially in the left subclavian, where it might be mistaken for aneurism. Such arterial murmurs may be due to laxity of the vessels from irregular vaso-motor tone of their muscular coats, as in Graves' disease.

The condition of the heart calls for more consideration. The old term 'irritable' well expresses its usual state, for it is easily excited by physical exertion or by emotion. The impulse is diffused and weak, while the first and second valvular sounds are not merely loud but there is less difference between them in quality than is normal. Sometimes the second sound is louder at the apex than at the base. There is often a striking similarity in these sounds to those observable in cardiac dilatation, and that they may be due to analogous conditions is not improbable, for mural softening with temporary distensibility occurs both in anæmia and as a result of poisoning by the rheumatic toxin.

On the other hand, systolic functional cardiac murmurs are often present in chlorosis. In about seventy-five per cent. they are most pronounced in the pulmonary area and are transmitted to the left. They often distinctly increase in intensity on lying down and diminish on standing up, or increase when the patient is turned on the right side and again lessen when he is turned on the left. Holding the breath also may diminish them, while they become louder with the succeeding deep inspiration. Organic murmurs, on the contrary, are rarely heard in the pulmonary area and are not much affected by changes of position except in some cases of mitral stenosis. A systolic cardiac murmur may be suspected to be functional in character when its point of greatest intensity is found in an unusual place for an organic murmur. Thus, as just remarked, organic murmurs in the pulmonary area are very rare, just where functional murmurs are common. But I have also found the junction of the left fourth rib with the sternum a frequent site for these sounds, and in several cases they were heard at the junction with the right fourth rib. True mitral systolic apex murmurs are also found in chlorosis, and of the same soft blowing character as that observed in the transient mitral murmurs which develop in some cases of rheumatic fever. Ludwig and MacAlister have shown that the auriculo-ventricular muscular structures have a sphincter-like action, whose narrowing of the mitral orifice greatly helps the valves to close it. Any cause, therefore, which produces softening of the cardiac muscle, as the rheumatic toxin does, or as may also happen in consequence of the degenerative effect of anæmia, would then allow insufficiency to occur without the valves being necessarily diseased; and hence with a restoration of the heart wall to its normal vigor these murmurs would disappear. It should always be feared, however, that an undue overtaxation of the heart at such times might cause this curable condition to pass into permanent organic change.

**PATHOLOGY.**—The pathology of this affection is still a matter of discussion and of diverse views. Pathological anatomy supplies but few data because patients rarely die from the affection. Rokitsansky's and Virchow's findings of general arterial hypoplasia in cases of this disease must be regarded as chiefly coincidences, because the great majority of chlorotics recover after proper treatment, which would not be possible if they were all the subjects of congenital malformation. Iron pills can hardly cure an aorta if it be too small, nor does this theory begin to explain why such a condition should diminish hæmoglobin only and not either the leucocytes or the albumen, and lastly why too small arteries should be thus operative only in females. Many writers, from Andrew Clarke down, incline to the operation of some specific toxin in the blood as the cause of the impoverishment of the corpuscles. As other forms of anæmia are increasingly ascribed to toxæmia it is natural to infer the same for chlorosis. The primary difficulty of this hypothesis is that it affords no explanation why chlorosis should occur only about or just after puberty, and it does not easily appear why such special toxin should be formed in the gastro-intestinal tract or elsewhere of young women only and not in older women as well. That the supposed toxæmia is of intestinal origin is negated by the observations of numerous investigators that neither indican nor the ethereal sulphates are in excess in chlorotic patients. The urine is simply deficient in solids, but contains no excess of iron, as in pernicious anæmia, nor of urobilin.

I incline rather to the view that the constitutional state accompanying the first establishment of ovulation is characterized by a special vulnerability to certain injurious influences which it takes time to outgrow. That the innervation and functions of the associated blood-making viscera in the abdomen are readily disturbed in women by influences propagated from the generative organs is shown often enough at the beginning of pregnancy when vomiting so induced may be severe enough to threaten life. The first onset of menstruation is not

without its counterparts to the first disorders of pregnancy, and as the derangements progress in either case we have often the same curious perversions of the appetite, like the cravings for wholly abnormal articles. The gastric troubles of pregnancy are explained by reflex irritation from the ovarian and uterine plexuses, but just such reflex irritation may occur from deranged menstruation.

Menstruation can be arrested by putting the feet in cold water, with great risk, however, of inducing the most pronounced and obstinate disorders of the functions and secretions of the entire gastro-intestinal tract. This irritation of cold, occurring under circumstances favorable for this effect, *i.e.*, while the ovaries are excited by the process of ovulation, may produce a persistent vaso-motor contraction of the arteries of the pelvic viscera first, and of other abdominal organs in succession, which effect is quite similar to that sometimes caused by a puncture or mechanical irritation of a nerve of the arm or of the leg, such as the musculo-spiral or anterior tibial, and which may radiate to all the arteries of the limb and produce tonic contraction of its muscles with coldness and wasting.

A remarkable case, published by me in the Transactions of the State Medical Society of New York for 1867, illustrates very fully how extensive and curious the effects may be of such a reflex irritation from cold during menstruation. The case was that of a girl who got a wetting during a cold thunder shower while she had her courses. They were immediately arrested, but she took no notice of any effect therefrom until she became so constipated that she passed a week without an evacuation. She was obliged then to admit that this was the case to her teacher at school, because of the excessively loud borborygmi which were heard by all in the classroom. Two physicians were called in consultation, who, finding they were unable to cause a movement, and stercoraceous vomiting having set in, summoned Dr. White, of Buffalo, late professor of obstetrics in the Bellevue Medical College of New York. He diagnosed intestinal obstruction, and advised a course of treatment which produced a number of free movements, which were remarkable for the almost total absence of any color, the fecal lumps resembling coarse plaster. On my seeing the case and recommending a free use of nitromuriatic acid, some copious "bilious" discharges followed, and hopes of recovery were entertained, when the same constipation and stercoraceous vomiting returned, along with a singular and very different train of symptoms. Her urine was suddenly suppressed one morning, but in twenty-four hours the saliva and tears welled out to the extent of from one to three pints a day. This continued for about a week with total suppression of urine-meantime, when it suddenly ceased and the urine commenced as before; and this strange alternation of secretion reoccurred again and again about every week, for two months, with alternate arrest of the bowel movements to be followed by fecal vomiting, until the death of the patient occurred from sheer exhaustion. This instructive case at least proves that a shock of cold proceeding from the feet may not only arrest the menses by reflex irritation but may also proceed to the production of virtual obstruction of the intestines by paralysis, and then continue to spread from one sympathetic ganglion to another, until the entire association of secretory nerves becomes deranged in turn, and the whole process of alimentation perverted.

It is quite conceivable, therefore, that until menstruation is thoroughly established, many young girls may have an undue susceptibility to sudden chill, particularly of the feet, whose vaso-motor nerves are in such close association with the pelvic circulation that the impression of cold made upon them checks, while heat promotes, the menstrual flow. The sudden derangement of menstruation thus induced by cold might then be propagated, as the first effects of pregnancy are propagated, until serious disorder of the gastro-intestinal secretions intervenes, with consequent impoverishment of the blood. Clinically it

is very frequently found that long antecedent to the development of the special symptoms, chlorotic girls have suffered from coldness of the feet, often with muscular pains in the lower extremities indicative of a pelvic vaso-motor irritation. It may be objected to this view that although amenorrhœa is the rule with chlorotics, yet some have a normal flow in amount or even more than normal; but, even with these cases, the function becomes in time very irregular and ultimately is suppressed.

**TREATMENT.**—Iron is the specific for chlorosis, and its remarkable curative effect in this complaint is doubtless the reason why iron is prescribed for every form of anæmia under the impression that it must act as a simple restorative when the blood becomes deficient in red corpuscles. The problem, however, is not so simple as it seems, for iron is actually mischievous in all febrile anæmias and of no avail in many grave forms that are not febrile. Moreover, in chlorosis the best results are secured by giving iron in large and not in small doses, in fact, in doses which are far larger than the corpuscles can possibly take up. Its presence in the intestinal canal seems to act as a stimulus to the assimilation of a normal quantity of iron to restore the deficient hemoglobin, and clinically it makes but little difference what the preparation of the drug is. Certainly the elaborate forms advertised as closer imitations of nature's own processes for taking up iron do not prove in practice to have any superiority over the common and much cheaper ferruginous salts. After repeated and careful comparative observations with different preparations, I am convinced that the sulphate of iron given in pill form in doses of from gr. iv. to vii., three times a day, is more effective than most other preparations, not excepting Bland's pills. A bi-weekly action on the bowels with aloes and rhubarb seems to hasten the assimilation of the iron, and in all cases characterized by intestinal flatulence it is a good plan to give gr. x. of sodium benzoate with gr. v. of salicin in capsules an hour after meals.

William H. Thomson.

**CHLOR-SALOL.**— $C_6H_4(OH)CO_2OC_6H_4Cl$ —Chlorophenol salicylate, salicylic-chlorophenol-ester. By the action of phosphorus pentachloride on a mixture of ortho- and para-chlorophenol, crystals are formed of the ortho- and para-salicylic-esters, differing from salol in containing an atom of chlorine in place of an atom of hydrogen. Both are insoluble in water and soluble in alcohol, the former melting at 55° C. (131° F.) and the latter at 72° C. (161.6° F.).

Nencki found that they split up in the intestines into a salicylic acid relative and chlorophenol, and that salicylic acid appeared in the urine. Girard speaks highly of them as intestinal antiseptics in diarrhœa and cystitis. Passerini obtained good results in bronchitis and pulmonary tuberculosis from the inhalation of fifteen drops once or twice a day for five to ten minutes. The first effect is said to be irritative, but after a day or two the cough begins to lessen and the secretion to diminish. The dose by mouth is 0.33-1 gm. (gr. v.-xv.) three to six times a day.

**CHOCOLATE.** See *Cacao, Butter of.*

**CHOLÆMIA.** See *Auto-Intoxication.*

**CHOLAGOGUES.**—This term is applied to medicines that increase the secretion of bile. It has been in use for more than two thousand years. The ancients observed, after the administration of certain purgatives, that the feces became markedly yellow or dark. They supposed this change of color to be due to an increased secretion of bile, and hence distinguished the purgatives producing it from others by the term cholagogues.

Until the middle of the nineteenth century clinical experience afforded the only evidence of the existence of cholagogues. The color of the feces was held to be a certain criterion of the quantity of bile excreted: dark-colored stools indicating redundancy, light-colored ones

deficiency of bile. Medicines that produce highly colored dejections, it was supposed, notably augment the secretion of bile. But the researches of physiological chemists have given little support to this theory. While it was found in experiments on animals upon which biliary fistulæ had been made, and in observations on patients with accidental biliary fistulæ, that a considerable quantity of bile is secreted in twenty-four hours, only very small quantities could be detected in the feces. Bidder and Schmidt<sup>1</sup> estimated the quantity of bile in the feces passed by a dog in five days, and detected only about one-eighth of the amount of the bile acids that had been secreted. Hence it was evident that the greater part of the bile acids—in the dog seven-eighths—is reabsorbed. Besides, it was shown by Frerichs<sup>2</sup> that the solid constituents of the bile, especially the pigments, suffer great changes in the intestine. These may vary much in health as well as in disease, depending upon the length of time the bile sojourns in the intestines, the kind of food eaten, the medicines taken, and other unknown conditions. Hence it followed that the color of the feces affords no certain clue to the quantity of bile secreted. It became extremely doubtful, therefore, whether the medicines that produce highly colored stools have any influence on the biliary function.

Nor have the numerous experiments made in the last half-century to determine the influence of medicines on the biliary function fully dispelled this doubt. Nearly all investigators found that the medicines to which an eminent cholagogue action had been attributed, especially calomel and other mercurials, are destitute of the power of increasing the biliary secretion. And in regard to those medicines that have gained celebrity in the treatment of diseases of the bile passages, especially the alkalies and alkaline mineral waters, the results of experimental researches have been so discrepant and mostly so negative that some of the best authorities deny that their utility is due to a stimulant action on the biliary function. Indeed, no other subject in the domain of pharmacology and therapeutics is in so unsettled a condition as that of cholagogues, and some recent competent writers aver that nearly all of the experiments on animals which seemed to demonstrate that numerous medicines increase the secretion of bile were made under such faulty or abnormal conditions as to be utterly valueless.

It seems proper, therefore, to consider in detail only those reputed cholagogues that are of recognized value in diseases of the liver and bile passages, and to adduce the experimental evidence pertaining to their cholagogue action only in so far as it may be conducive to a better understanding of their practical application.

**Bile.**—According to recent researches, bile itself is the mightiest cholagogue. Its power to increase the secretion of bile has been known for three decades. Schiff<sup>3</sup> observed, when he injected bile into the duodenum of an animal upon which a biliary fistula had been established, that in twelve or fifteen minutes a very decided flow of bile took place from the fistula. In a dog with a biliary fistula, the amount of bile secreted was about 2 c.c. in twenty minutes. The injection of 180 c.c. of fresh ox bile into the duodenum was followed by a surprising increase of the amount of bile, so that after a short time 10 c.c. of bile could be collected from the fistula in twenty minutes. An analysis of the bile showed that the solids as well as the water were increased.

Prevost and Binet<sup>4</sup> investigated the action of numerous drugs on the secretion of bile in dogs with biliary fistulæ. Among those that markedly augmented the flow of bile from the fistulæ, bile itself had the most pronounced effect.

Doubtless the most important experiments demonstrating the action of bile on the liver are those of Pfaff and Balch,<sup>5</sup> made on a woman who had a biliary fistula after the operation of cholecystotomy. The quantity of bile this patient ordinarily secreted in one hour varied from 8 to 42 c.c. Sometimes the maximum was shortly before, sometimes shortly after meals. The secretion, though very irregular, generally increased after meals and dur-

ing the day, and lessened during the night, reaching the minimum early in the morning. The amount secreted in twenty-four hours, estimated for three days, was nearly constant, varying only from 501 to 525 c.c.

In order to administer the patient's bile, it was evaporated and formed into pills with glycerin, so that each pill corresponded to 25 c.c. of bile. After three pills, given in one day, the amount of bile secreted in twenty-four hours was 546 c.c.; after twelve pills, 600 c.c., and after twenty pills, 685 c.c. The solids of the bile increased from 1.7 per cent. to 2.04 per cent.

Ox gall dried to a powder and made up into pills with glycerin, each containing 0.5 gm. ox gall, had a more notable effect, twenty pills, given during a day, increasing the bile secreted in twenty-four hours to 770 c.c.; and increasing the solids of the bile from 1.69 to 2.62 per cent.

A mixture of pure salts of glycocholic and taurocholic acids was given in pills, each containing 0.25 gm. of bile salts. Two pills, given in a day, increased the bile to 701 c.c.; and eleven pills, given in a day, increased the bile secreted in twenty-four hours to 787 c.c., and the solids to 2.18 per cent.

Pfaff and Balch recommend, in cases indicating cholagogues, inspissated ox gall in pills each containing 0.25 gm., two to five pills to be taken three times a day. They suppose that bile may sometimes be useful in constipation and in cases of defective absorption of fat.

Stadelmann<sup>6</sup> is of the opinion that for therapeutic purposes the bile acids deserve consideration, because they are thrown out unchanged with the bile and sometimes increase the water of the bile as much as eighty to ninety per cent. Besides, the salts of the bile acids are the best solvents of cholesterol; hence they may be employed to dissolve concretions in the gall bladder and to promote the absorption of fat when it is defective in consequence of scanty secretion of bile. The presence of icterus contraindicates their use, because the toxic action of the bile acids might result in slowing of the pulse and destruction of the red blood corpuscles. Sodium glycocholate has been found to be ten times less poisonous than is sodium taurocholate; hence for therapeutic purposes inspissated ox bile, which contains chiefly the former, is an appropriate preparation. Gall stones, however, do not usually consist of pure cholesterol, but of layers of lime salts alternating with cholesterol; hence bile or bile salts will rarely dissolve them.

Gautier<sup>7</sup> states that he has frequently used ox gall with success in cholelithiasis. He began its use in 1891 in the case of a woman who for a number of years had suffered severely from so-called gastralgia. After a very severe attack, which was followed by slight icterus and the passage of numerous gall stones, Gautier had recourse to a decolorized and sterilized extract of ox gall, each decigram of which corresponded to about 1 gm. of gall. This was given in pills containing 0.1 gm. The patient took one or two of the pills during meals for several years. The attacks of colic ceased. Gautier holds that ox gall will not dissolve gall stones nor prevent their painful passage through the bile ducts, but that it will prevent the formation of fresh concretions, and a relapse after surgical removal of the calculi.

**Sodium Salicylate.**—This medicine has been much employed in various febrile affections, and as a specific in acute rheumatism, since first recommended by C. E. Buss<sup>8</sup> in 1875. Although large doses were administered, no effects were observed that could be attributed to an increased secretion of bile. The credit of the discovery of its cholagogue action belongs to Rutherford.<sup>9</sup> Having found experimentally that the benzoates increase the secretion of bile, he supposed, from the near chemical alliance of salicylic and benzoic acids, and from the fact that both combine in the body with glycocholic, that sodium salicylate would exert some effect on the secretion of bile. A series of experiments on fasting dogs with temporary biliary fistulæ gave a positive result. Within half an hour after the sodium salicylate, dissolved in water, was injected into the duodenum, a marked in-